Assignment #2
CS3300

1. [5] **Activation records**: Draw the runtime activation records at the entry and exit to each function. Pay special attention to the following fields of the activation records: actual parameters, return value, control link, and local variables.

```
main(){
  int x = 28;
  int y = 21;
  int z = g(x, y);
}
int g(int x, int y){
  int z = 0;
  if (x == y) z = x;
  else if (x < y) z = g(x, y - x);
  else z = g(y, x - y);
  return z;
}
```

2. [5] **Code generation**: For the following C code, write the three-address code, draw the flow graph, compute the dominators, mark the back-edges and enumerate the loops and the nodes contained therein.

```
{ // A and oldA are two dimensional arrays
  // containing floating point numbers.

  memcpy(oldA, a, m * n * 4);
  change = true;
  while (change) {
    change = false;
    for (int i=0;i<m;++i){
      for (int j=1;j<n-1; ++j){
        a[i,j]=(a[i,j-1]+a[i,j+1])/2
        if (fabs(oldA[i][j] - a[i,j]) >= delta){
          change = true;
        }
      }
    }
    memcpy(oldA, a, m * n * 4);
  }
}
```

3. [5] **Peephole optimization**: Write a pass of peephole optimization to eliminate *unreachable* code. A statement is considered unreachable, if control cannot reach that statement.
4. [5] **Register Allocation**: The Kempe's heuristic of register allocation is based on a simple premise that a graph G is K-colorable, iff the graph G' obtained by removing a node whose degree is $< K$ is K-colorable. Prove the premise.
5. [5] **Personal!** Based on the portion covered after mid-term in CS3300, make an interesting question and attempt an answer for the same. Credit will be given based on the creativity, ingenuity, and coolness of the question and the answer.